

The concluding section treats of solid geometry, after Euclid xi., and of the mensuration of simple solids. Particular care has been taken in regard to the figures; they are drawn in oblique parallel or metric projection, are lightly shaded, and are very effective indeed. A few problems on the setting out of such figures to scale, and of the measuring of dimensions from them, would have been interesting and instructive. Also in this section we should like to have seen some account of the graphic representation and measurement of position in space by means of orthogonal projections. In the geometry of the prism, pyramid, wedge, cylinder, cone and sphere, geometrical, algebraical and trigonometrical methods are very happily and naturally combined, resulting in a fuller treatment than is usually met with in similar text-books; many well selected numerical examples are worked out. The prismoidal formula is explained and applied to specific cases. Altogether the author is to be congratulated on the production and completion of a very excellent text-book of elementary geometry on modern lines.

In the "Rudiments of Geometry" the author gives a course which she claims to have introduced successfully at the Municipal Technical School, Gravesend. It is based on experimental work, and is carried on along with practical geometry. Specific drawing exercises are set, and the pupils are required in each case to write out in their own words an account of what they have done, and of any inferences or discoveries they may have made. Formal proofs then follow, and are intended to be based on the collective suggestions of the class; these in turn are reproduced on paper by each boy or girl independently. There are two appendices containing between four and five hundred exercises in geometry. In these the old school of art course is too prominent. It seems to us that the scheme of the book is unduly extended, and that the work must suffer from lack of freshness and variety before the pupils have proceeded very far.

There is little that we can commend in the geometry of Mr. Boulton. The author attempts to cover too much ground in the comparatively small space available, so that nothing is very satisfactorily accomplished.

#### OUR BOOK SHELF.

*Ansichten und Gespräche über die individuelle und spezifische Gestaltung in der Natur.* By Franz Krašan. Pp. vii+280. (Leipzig: Engelmann, 1903.) Price 6s. net.

THIS quaint but very serious book is an expression of the author's attempts to reach some clearness in regard to the conceptions of species, variety, breed, &c., which he has had to deal with in the course of his botanical studies. He discusses the profoundest questions of biology:—How far is organic form a function of organic substance? What is the nature of reaction to surroundings? Can one distinguish between the original and the accessory characters of individuals? What is the real meaning of metamorphosis and substitution of organs? What is the evolutionary import of variation and mutation and

modification? How are we to define species, variety, and breed? What is the scope of hybridisation and in-breeding, of isolation and selection? In short, Franz Krašan traverses the whole field of evolution-theory. And yet the result, to our mind at least, is deplorable—nothing short of a pathetic waste of careful and assiduous thinking, for he has cast his book in the form of dialogues between Arthur, Erwin, Fritz, Julius, Raimund, Walther, and possibly some others whose acquaintance we have not been able to make! They are most honourable gentlemen, with a facility of discourse and a knowledge of biology that make one blush; they bid one another a most courteous "Auf Wiedersehen" after discussing "System und Phylogenie," or the Hieraciums of Central Europe; they reappear cheerful and cocksure, like Job's friends, to reiterate their various convictions, while the reader undevoutly wishes that they would all die off and leave Franz Krašan to tell us in plain German what he really means.

We are told that the "sachkundige Leser," which we had mistakenly assumed to mean ourselves, should have no difficulty in appreciating the incognitos of Arthur, Erwin, Fritz, and Company, but there are puzzles enough in nature without making more in biological literature, and we "give it up." Not, however, without saying that the author has the results of much careful work and thought to communicate, the pity being simply that he has hidden his light under the bushel of a method of presentation which is anachronistic, repellant and absurd. We hope that he will feel himself impelled to part company with Arthur, Erwin, Fritz, &c., and tell us in a short essay what he really thinks about individual and specific characters as these occur in nature. J. A. T.

*Vegetationsbilder.* By Dr. G. Karsten and Dr. H. Schenck. Plates 48. (Jena: Gustav Fischer, 1903.)

BOTANISTS have been distinctly tardy in taking advantage of the facilities offered for introducing photographic illustration into descriptive books. Some American elementary text-books contain very excellent flower studies and ecological scenes, but practically the only standard work in which full advantage has been taken of photographic reproduction is Schimper's "Pflanzengeographie," in which the epoch-making physiological treatise is embellished with magnificent illustrations.

It may be assumed that the success of Schimper's book prompted the publication of this work, in which the illustrations form the main feature, and the text is added by way of explanation and comment. The work has been issued in eight parts, each of which may be purchased separately, and each part contains six plates illustrative of a particular region or representing plants associated by common characters. Three parts deal with tropical lands in which moisture-loving plants abound, and these contain illustrations of rain-forests in Mexico, Java, and Brazil. The superabundance of vegetation does not lend itself well to photography, but the extraordinary development of climbing aroids and epiphytes is well shown. Another conspicuous feature of these regions is the prevalence of large-leaved plants—species of *Heliconia*, *Calathea*, *Begonia*, and many belonging to the order *Melastomaceæ*—which constitute the ground vegetation. Owing to the more obvious characteristics and the reduced number of plants growing in dry or exposed situations, the photographs of South African scenes, of the seashore vegetation of Brazil, and of Mexican types are the most successful. Of the general character sketches, interest attaches to that showing the growth of *Ipomoea pes-caprae*, but quite the most striking is the illustration of the spread of the sedge

plant *Remirea maritima* and the grass *Stenotaphrum americanum*. Many of the illustrations are limited to the study of a single tree or shrub, indeed all in the parts which deal with monocotyledonous trees and economic plants.

The editors, Drs. G. Karsten and H. Schenck, have provided a very useful and instructive series of plant studies, and it is to be hoped that the publishers will be encouraged to arrange further series. To the botanist and plant lover, as well as to the student, these carefully prepared illustrations should be of very great interest, and will help to make more definite the written descriptions of travellers.

*Photographic Failures. Prevention and Cure.* By "Scrutator." Pp. 94. (London: Published for the Photogram by Dawbarn and Ward, Ltd., 1903.) Price 1s. net.

THE subject of this book will appeal to numerous photographers, for many are the pitfalls which they try to avoid.

Negatives may be too hard or too dense, thin, fogged, unsharp, spotted, curiously marked, &c., and prints may suffer from many similar blemishes.

A book that will inform the photographer of the remedies that may be applied to the particular fault in question is one that should be thoroughly welcomed.

"Scrutator," of the *Photogram*, seems to have supplied this want, and confines his antidotes to the problems which beset the practical photographer. The method of treatment adopted is to describe each failure, fault or defect, then to state the causes to which they are due, and finally to suggest either the preventatives or the remedies to be employed. In the case of negatives he gives some specimen negative prints on thin transparent paper to show how incorrect exposure and development affect the relative tones. The book is one that will be very useful to every photographer.

*Up-to-Date Tables for Use throughout the Empire. Weights, Measures, Coinage.* Compiled and written by Alfred J. Martin. Pp. 251. (London: T. Fisher Unwin, 1904.) Price 2s. 6d.

THE compiler of this collection of tables believes that the adoption of the metric system of weights and measures for use within the Empire is near at hand, and it is to be hoped his optimism will be justified. He maintains "that if the metric system were made compulsory for railway companies; were adopted by the Bank of England; and shown on our Ordnance Surveys; that within a very short time the system would be generally adopted throughout the Empire." It is unnecessary to do more than mention a few of the numerous tables provided. There are tables showing the relations of various weights and measures of water and of its density at different temperatures; a comparison of British and international systems of physical units, and of measures of time. The little book should certainly serve to popularise the decimal system. A penny supplement for beginners, intended as a guide to simple arithmetic and to show how decimals can be taught at an early age, is also published.

*Arithmetical Examples.* By W. G. Borchardt, M.A., B.Sc. Pp. viii+279. (London: Rivingtons, 1903.) Price 3s.

THESE examples, with the exception of one paper, are taken from the author's "Arithmetical Types and Examples" recently noticed in these columns. The exercises are numerous and well graded, and in drawing them up Mr. Borchardt has kept the recommendations of the Mathematical Association Committee before him.

## LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

### Röntgen Rays and the $\gamma$ Rays from Radium.

It has been proved by Mr. Strutt that, for the  $\gamma$  rays of radium, the relative conductivity of gases varies approximately as the density, whereas there is a wide divergence from this law in the case of Röntgen rays. Taking air as the standard, the figures given are:—

	Density	$\gamma$ Rays	Röntgen Rays
Air ... ..	1.00	1.00	1.00
Carbon dioxide ... ..	1.53	1.53	1.60
Sulphur dioxide ... ..	2.19	2.13	7.97
Chloroform ... ..	4.32	4.88	31.9
Methyl iodide ... ..	5.05	4.80	72.0

Prof. Rutherford suggested some comparative experiments to ascertain if the more penetrating Röntgen rays, after passing through thick metal screens, were similar in their action to the  $\gamma$  rays of radium. The experiments have proved that the relative conductivity imparted to gases by Röntgen rays is a function of the penetrating power of the rays employed, and the results obtained approximate to those found for the  $\gamma$  rays rather than to the high figures previously quoted for Röntgen rays.

In the experiments, two electroscopes were placed side by side, completely enclosed in two thin lead vessels the sides of which were 1.8 mm. thick. A large "hard" bulb and a powerful induction coil were used. The rates of discharge for air were ascertained to be identical, and one of the electroscopes was then filled with gas under examination, and the rates were again measured.

In the case of sulphuretted hydrogen, for which a ratio of six to one has been obtained for ordinary Röntgen rays, the present experiments for penetrating rays showed a close equality with air. This is in agreement with the relative conductivity obtained for the  $\gamma$  rays. Results of a similar character have been obtained for chlorine and for air saturated with chloroform. Further experiments are in progress to compare the relative conductivity of a number of gases for the two kinds of rays.

The results so far obtained indicate that the differences in the relative conductivity of gases, previously observed for Röntgen and  $\gamma$  rays, were due to the great difference in the penetrating power of the rays in the two cases, and that, for Röntgen rays comparable in penetrating power with the  $\gamma$  rays, these differences to a large extent disappear.

A. S. EVE.

McGill University, Montreal, February 18.

### Nature of the $\gamma$ Rays from Radium.

THE interesting results recorded by Mr. Eve in the preceding letter on the relative conductivity of gases for very penetrating Röntgen rays removes the strongest objection that has been urged against the common belief that the  $\gamma$  rays are an extremely penetrating type of Röntgen rays. All the experimental evidence so far obtained is now in agreement with the view that the  $\gamma$  rays are very penetrating Röntgen rays which have their source in the atom of the radio-active substance at the moment of the expulsion of the  $\beta$  or cathodic particle. For example, I have found that the  $\gamma$  rays from radium always accompany the  $\beta$  rays, and are always proportional in amount to them. In radium the  $\beta$  and  $\gamma$  rays appear only in the third change occurring in the radio-active matter which causes "excited activity," i.e. in the fourth of the chain of radio-active products which result from the disintegration of the radium atom.

In addition, as Mr. Ashworth pointed out in a recent letter to this Journal (January 28), the fact that the amount of  $\gamma$  rays from radium is independent of its degree of concentration points to the conclusion that the  $\gamma$  rays arise from the disintegrated atom, and are not secondary rays set up by the bombardment of the radium as a whole by the  $\beta$  rays.

On the theory of the nature of Röntgen rays, developed